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MINOR NOTICES

Index Filicum.—In 1905 CARL CHRISTENSEN published his *Index Filicum*, and now a supplement has appeared,[6] covering the period 1906–1912. The two parts are (1) the supplement, which contains all the names of ferns published during 1906–1912, and (2) corrections. In the supplement there are enumerated 33 names of new genera and subgenera that have been proposed. The number of species described as new during the period covered, and adopted in the supplement, is 1644. Eliminating the older species that have been reduced to synonyms, and adding the new ones, the number of species of ferns recognized by CHRISTENSEN at the end of 1912 is 7411.—J. M. C.

The fresh-water flora of Germany, Austria, and Switzerland.—Part 14 of this series of brochures has now appeared.[7] The four previous parts have been noted in this journal.[8] The present part presents the Bryophytes, and the keys, descriptions, and excellent illustrations should make their identification comparatively easy. The genera and species presented under the three groups are as follows: Sphagnales, 48 species; Bryales, 50 genera and 131 species; Hepaticae, 25 genera and 60 species.—J. M. C.

NOTES FOR STUDENTS

Natural vegetation and crop production.—In a careful study in one of the broad valleys in the Great Salt Lake Basin, KEARNEY[9] and his associates have shown that the natural vegetation of the area is so reliable an indication of the physical and chemical conditions affecting plant life that it affords an excellent basis for estimating the capabilities of the land for crop production. The report gives a good example of the quantitative investigation of the moisture and salt contents of the soil and the efficiency of the wilting coefficient in expressing the relation of the soil moisture to plant life and growth. Nearly all of the plant associations considered are dominated by a single species and very definitely limited in their extent.

The sagebrush (*Artemisia tridentata*) association is found in the higher portions of the valley. With an average precipitation of 40 cm., the growth-water is exhausted early in the summer, as shown by their determinations, but there is no excess of alkali salts. A good development of this association indicates land well adapted to both dry and irrigation farming, the taller and thicker the sagebrush the richer the soil.

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[6] CHRISTENSEN, CARL, Index Filicum. Supplementum 1906–1912. pp. 132. Hafnia, Denmark: H. Hagerup. 1913.

[7] PASCHER, A., Die Süsswasser-Flora, Deutschlands, Österreichs, und der Schweiz. Part 14. Bryophyta, by C. H. WARNSTORF, W. MONKEMEYER, and V. SCHIFFNER. pp. 222. *figs. 158*. Jena: Gustav Fischer. 1914. *M* 5.60.

[8] BOT. GAZ. **56**:233. 1913.

[9] KEARNEY, T. H., BRIGGS, L. J., SHANTZ, H. L., and others. Indicator significance of vegetation in Tooele Valley, Utah. Jour. Agric. Research **1**:365–417. 1914.

Areas next below the sagebrush are occupied by the *Kochia* (*K. vestita*) association, and this was found to indicate a soil of finer texture, with similar moisture conditions, but with only the first foot of soil free from an injurious quantity of alkali salts. Dry farming does not succeed on this area because of the small amount of soil free from alkali, while the relatively impervious nature of the soil prevents the washing out of the alkali by irrigation; hence *Kochia* land scarcely permits crop production.

Following the *Kochia* belt comes the shad scale (*Atriplex confertifolia*) association, with soil moisture and alkali conditions similar to the preceding, but with a soil containing much gravel. Here dry farming does not succeed, but with irrigation the alkali would be more readily washed out and hence the crop probabilities are better.

The study continues with the associations of the lower, more alkaline areas, indicating as before the agricultural possibilities of the land. In addition to the value of the various associations as crop indicators, their composition is detailed, the successions noted, and the root characters of the principal species studied. The report is an excellent example of applied ecology.—G. D. FULLER.

The ecology of Calluna.—The common European heather, *Calluna vulgaris*, has been regarded as a typical calciphobe by CONTEJEAN and other partisans of the chemical as opposed to the physical theory of plant distribution. Furthermore, the heather is regarded as partial to acid soils, which also are deficient in certain mineral constituents, and hence are betokened sterile. *Calluna* occurs in various places on the chalk downs of southern England, being accompanied by several other species that are alien to the ordinary flora of the chalk; usually the heather patches are sharply delimited from the surrounding chalk associations. Miss RAYNER[10] has been making some detailed investigations of *Calluna* on the downs, and although much remains to be explained, a large contribution has been made to the ecology of the species. On the downs the heather grows in neutral soil, rich in most ordinary mineral constituents, but poor in lime; the roots, however, often penetrate down into soil areas that are rich in lime. The proportion of magnesia is relatively high. Cultures were made in soil from the heather areas and in ordinary chalk soil containing over 40 per cent of calcium carbonate. In the latter soil there were noted certain abnormalities, such as reduced capacity for germination and arrested development of the various organs; extensive bacterial colonies developed about the roots, and the mycorhizal fungus developed poorly. The relation of *Calluna* to its root fungus is obligate; the primary root becomes infected

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[10] RAYNER, Miss M. C., The ecology of *Calluna vulgaris*. New Phytologist **12**: 59–77. *pl.* 1. *figs.* 2. 1913; see also preliminary paper, *ibid.* **10**:227–240. *figs.* 2. 1911.